

Accuracy Characteristics for Final Delivery Scenario Hours 1500-2000 Single Site

1 Introduction

This document contains scenario characteristics for hours 1500 to 2000 GMT recorded on May 26, 1999 at Memphis ARTCC and cover either the ZME or ZID airspace. Characteristics to be provided are general statistics determined from the scenario on airspace characteristics, aircraft to aircraft and aircraft to airspace encounters, general air traffic, aircraft, flight plan adherence, interfacility traffic flow and deviations in weather forecasts. Definitions of the provided scenario characteristics are provided in Reference[1].

2 Reference

[1] Paglione,M., Oaks,R., Ryan,Dr. H., Summerill,J.S., (Final, January 2000), *Description of Accuracy Scenarios for the Acceptance Testing of the User Request Evaluation Tool (URET) / Core Capability Limited Deployment (CCLD)*, FAA William J. Hughes Technical Center / ACT-250, Atlantic City, New Jersey.

NOTE – Section numbers in this document do not map to those of the reference document.

3 Center Airspace

This section corresponds to Section 3.1 of Reference[1]. The below data corresponds to the ZME Center using the May 20, 1999 ACES chart cycle. Information gathered from running URET PRE, accessing the ZME Center Internet site and local knowledge.

Metric	Definitions	Count
Center Area	Approximate Square Miles	120000
Airports	From URET DU Adaptation List	778
Sectors	From URET DU Adaptation List	110
SAA	Special Activities Airspace	57
APDIA	Automated Problem Detection Inhibited Area	20
SID	Standard Instrument Departure	11
STAR	Standard Arrival Route	10
PAR	Preferential Arrival Route	594
PDR	Preferential Departure Route	346
PDAR	Preferential Departure Arrival Route	124

4 Aircraft Encounter Distributions

The statistics collected in this section characterize aircraft to aircraft encounters. The encounter counts are partitioned by selected minimum horizontal separation intervals, a count of encounters partitioned by standard flight levels, and by vertical phase of flight and aircraft encounter angle. This section corresponds to Section 3.2.1 in Reference[1].

4.1 Count Partitioned by Minimum Horizontal Separation

This section corresponds to Section 3.2.1.1 in Reference[1].

Table 1: Count of Current Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	13 Minutes Adherence
$0 \leq d < 5$	126	86
$5 \leq d < 10$	165	108
$10 \leq d < 15$	227	128
$15 \leq d < 23$	438	260
$23 \leq d < 30$	407	237
Total	1363	819

Table 2: Count of Trial Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
$0 \leq d < 5$	126	82
$5 \leq d < 10$	165	107
$10 \leq d < 15$	227	124
$15 \leq d < 24$	508	291
$24 \leq d < 30$	337	186
Total	1363	790

4.2 Count Partitioned by Altitude for Standard Separation Intervals

This section corresponds to Section 3.2.1.2 of Reference[1].

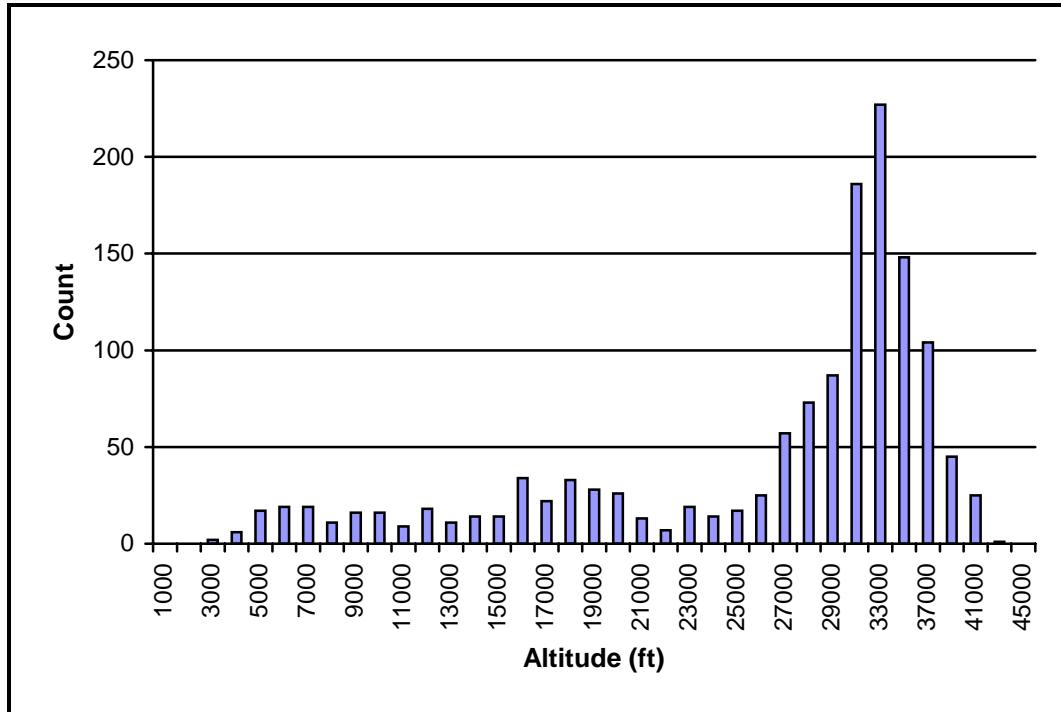


Figure 1: Aircraft to Aircraft Encounters by Altitude

4.3 Count Partitioned by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.1.3 of Reference[1].

Table 3: Count of Aircraft Encounters Partitioned by Phase of Flight and Encounter Angle

Vertical Phase	Encounter Angles (deg)				Total
	[0, 45)	[45, 90)	[90, 135)	[135, 180]	
Cruise-Cruise	103	109	42	38	292
Descend-Descend	26	21	11	9	67
Climb-Climb	16	14	3	6	39
Cruise-Climb	153	80	80	97	410
Cruise-Descend	149	89	81	119	438
Climb-Descend	32	15	17	22	86
Unknown	21	8	1	1	31
Total	500	336	235	292	1363

5 Airspace Encounter Distributions

This section provides statistics on aircraft to airspace encounters. Three areas considered are counts partitioned by selected minimum horizontal separation intervals, an encounter count partitioned by standard flight levels, and a count partitioned by vertical phase of flight and airspace encounter angle. Additionally, vertical phase of flight count is separated into top, bottom and side airspace encounters and for encounters with unknown encounter angles. The section corresponds to Section 3.2.2 of Reference[1].

5.1 Count Partitioned by Minimum Horizontal Separation

The section corresponds to Section 3.2.2.1 of Reference[1].

Table 4: Count of Current Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	13 minutes Adherence
Conflicts ¹	2146	1829
$d = 0^2$	36	29
$0 < d < 7$	846	682
$7 \leq d < 9$	225	170
$9 \leq d < 11$	211	157
$11 \leq d < 16$	518	411
$16 \leq d < 30$	1751	1370
Total	5733	4648

Table 5: Count of Trial Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
Conflicts ³	2146	1787
$d = 0^4$	36	27
$0 < d < 8$	967	765
$8 \leq d < 11$	315	234
$11 \leq d < 13$	204	157
$13 \leq d < 19$	689	552
$19 \leq d < 30$	1376	1024
Total	5733	4546

¹ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

² This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

³ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

⁴ This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

5.2 Count Partitioned by Altitude

This section corresponds to Section 3.2.2.2 of Reference[1].

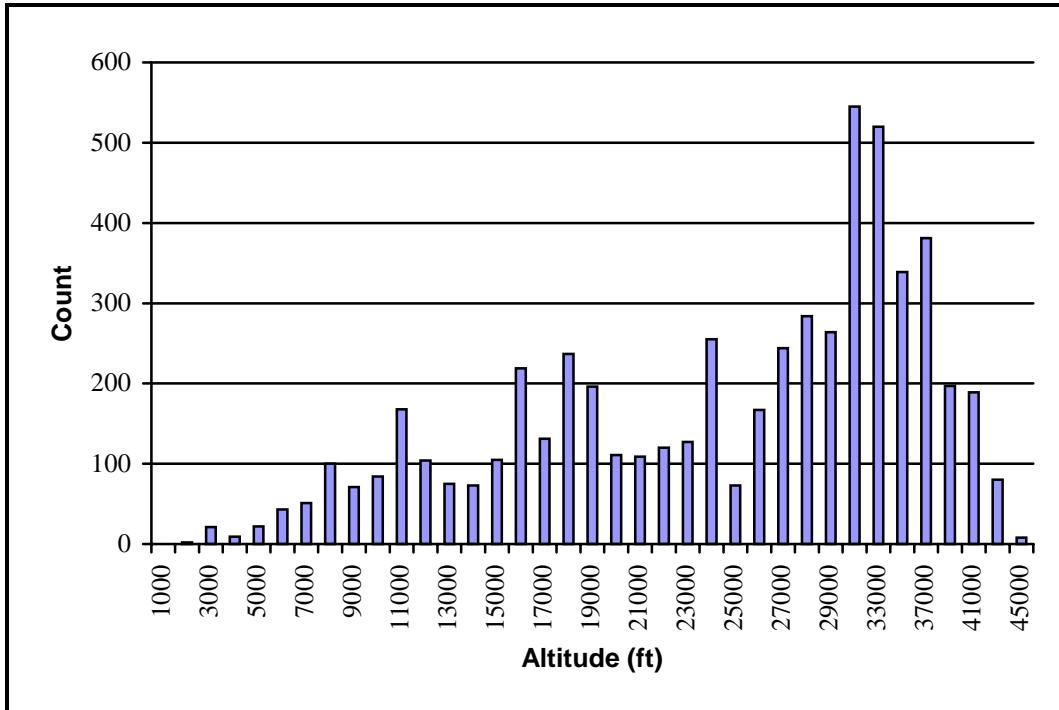


Figure 2: Airspace to Airspace Encounters by Altitude

5.3 Count by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.2.3 in Reference[1].

Table 6: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Side Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	12	59	122	193
Cruise	185	505	734	1424
Descend	17	53	56	126
Total	214	617	912	1743

Table 7: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Top and Bottom Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	153	0	0	153
Cruise	3	0	0	3
Descend	22	0	0	22
Total	178	0	0	178

Table 8: Count of Airspace Encounters by Vertical Phase of Flight with Unknown Angles

Vertical Phase	Count
Climb	47
Cruise	146
Descend	32
Total	225

6 Air Traffic Distributions

This section provides metrics that characterize the air traffic. The metrics are flight density partitioned by standard flight levels, flight type and sector penetration, statistics on the number of active flights, ground speed statistics, counts of interim altitude and amendment messages, and air traffic maneuvers by altitude and phase of flight. This section corresponds to Section 3.3 of Reference[1].

6.1 Air Traffic Density

This section corresponds to section 3.3.1 of Reference[1]. Detailed statistics on aircraft encounters are provided in Appendix A.

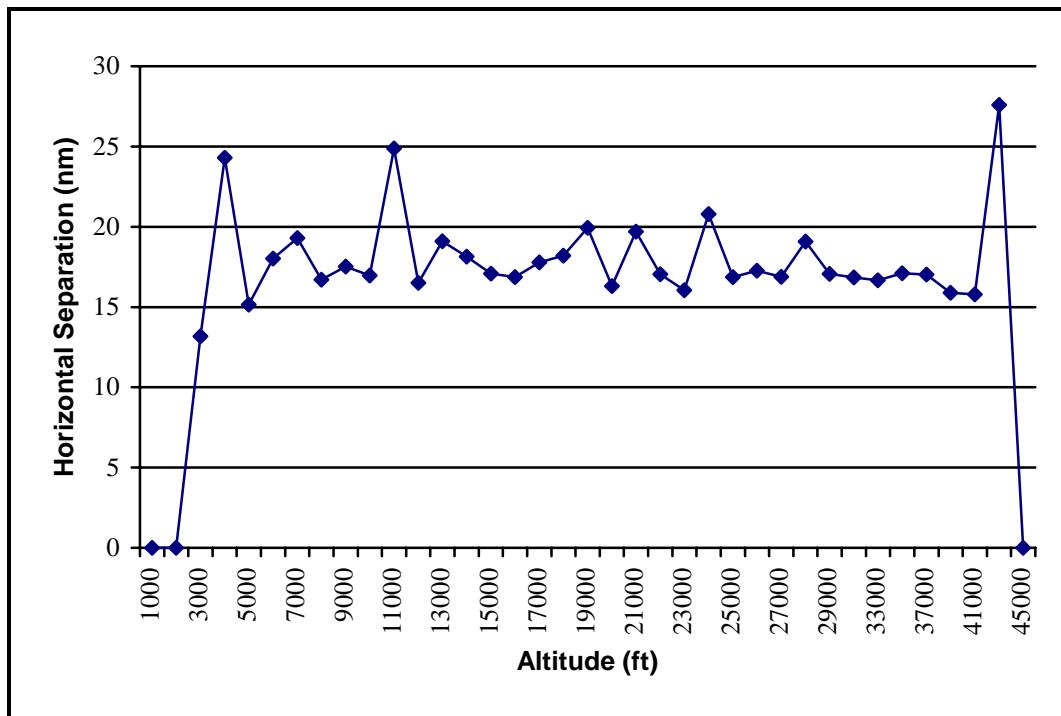


Figure 3: Average Horizontal Separation by Altitude for All Hours

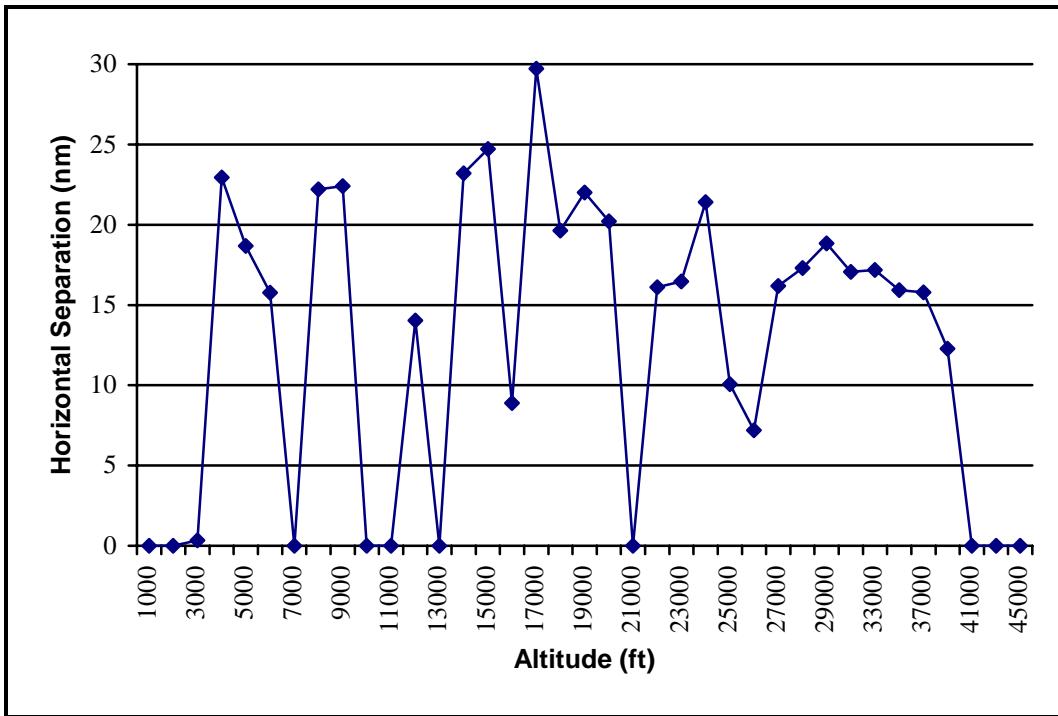


Figure 4: Average Horizontal Separation by Altitude for Hour 1

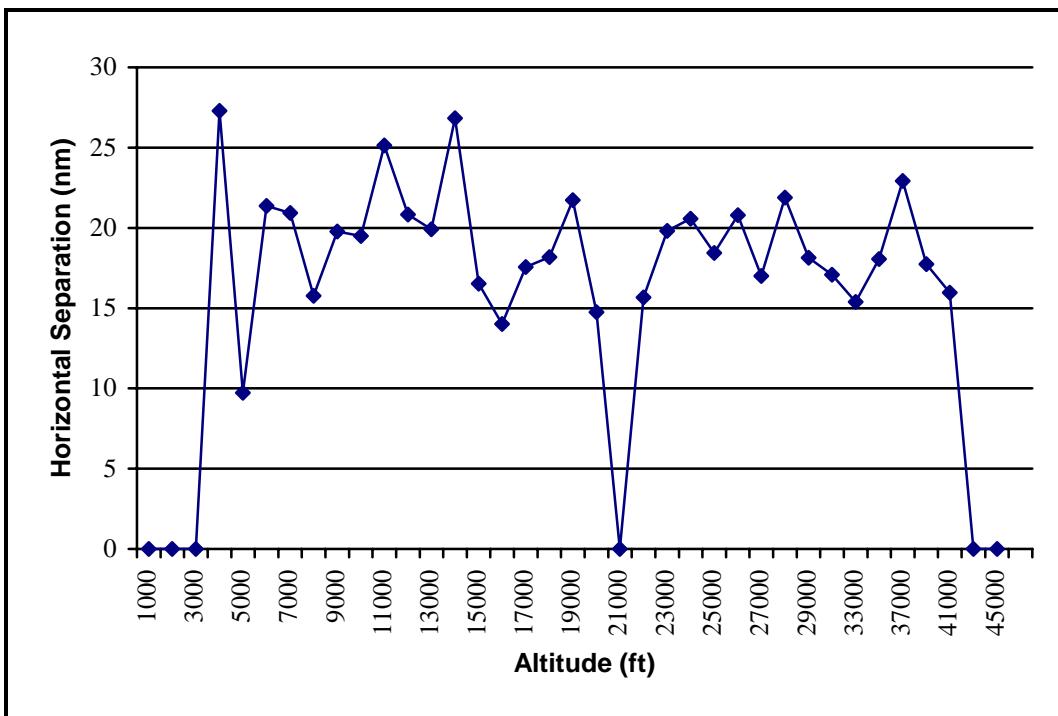


Figure 5: Average Horizontal Separation by Altitude for Hour 2

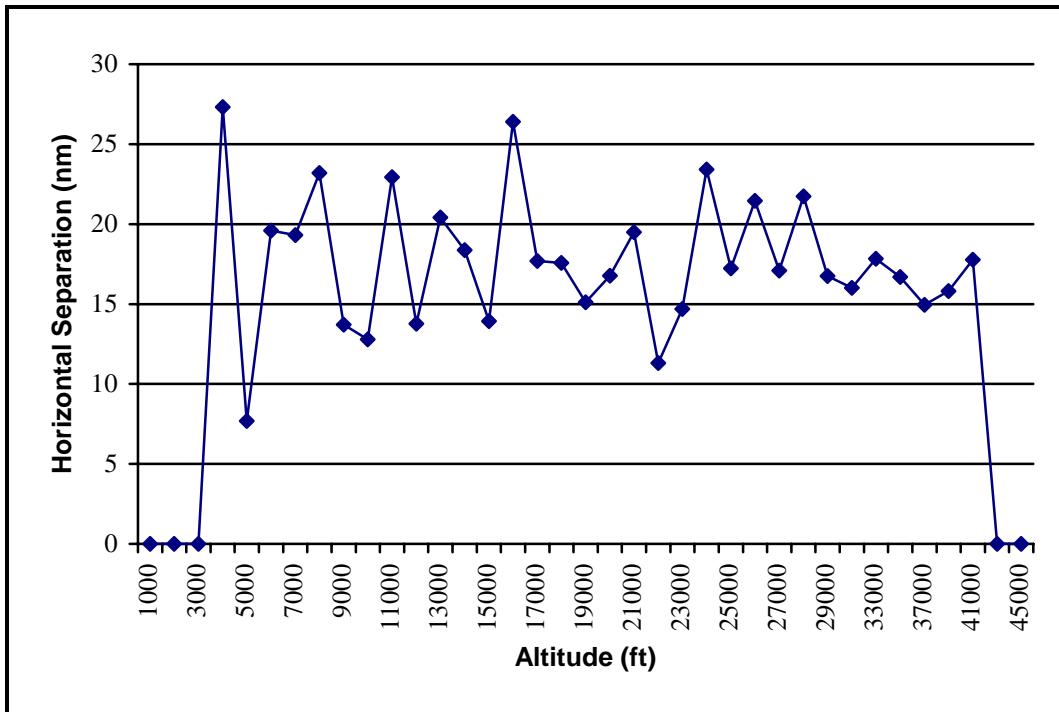


Figure 6: Average Horizontal Separation by Altitude for Hour 3

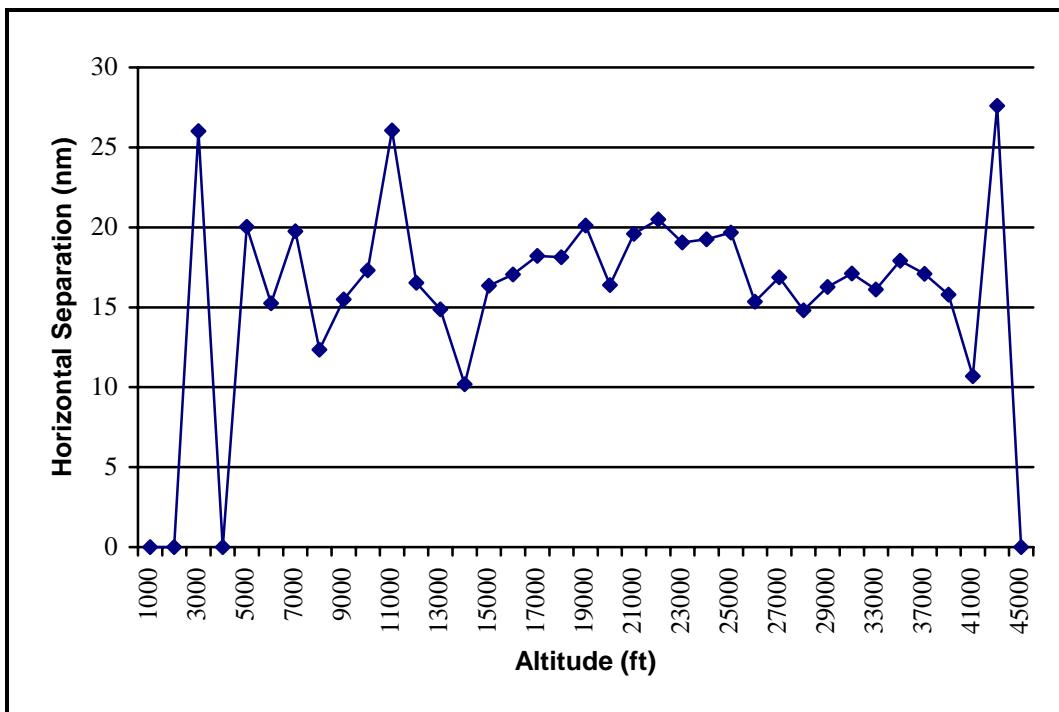


Figure 7: Average Horizontal Separation by Altitude for Hour 4

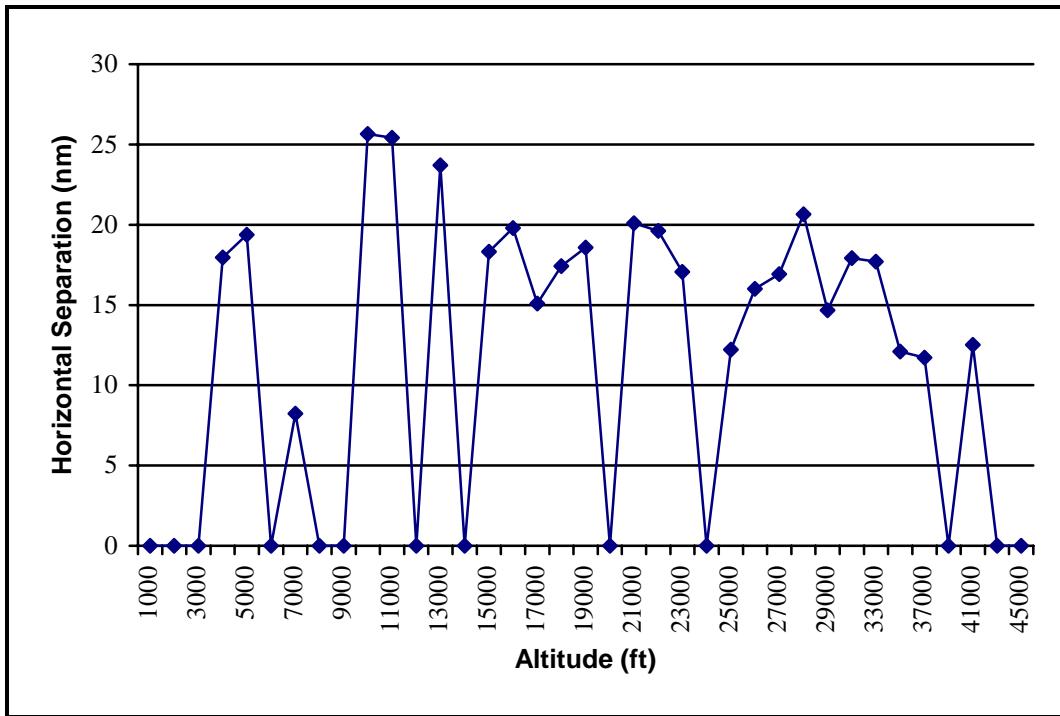


Figure 8: Average Horizontal Separation by Altitude for Hour 5

Appendix A: Supplement to Section 6.1 - Aircraft Traffic Density

Table 9: Statistics on Aircraft Encounters by Altitude Interval for All Hours

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	2	13.179	18.147
4000	6	24.302	3.983
5000	17	15.148	8.502
6000	19	18.028	6.497
7000	19	19.295	6.689
8000	11	16.711	7.692
9000	16	17.523	9.730
10000	16	16.968	8.871
11000	9	24.876	4.161
12000	18	16.513	8.501
13000	11	19.104	6.485
14000	14	18.149	6.860
15000	14	17.085	8.633
16000	34	16.867	7.668
17000	22	17.772	6.708
18000	33	18.206	6.472
19000	28	19.924	6.187
20000	26	16.315	7.170
21000	13	19.686	6.384
22000	7	17.050	5.868
23000	19	16.046	7.012
24000	14	20.791	5.946
25000	17	16.856	8.483
26000	25	17.271	7.992
27000	57	16.891	8.725
28000	73	19.071	7.510
29000	87	17.064	7.157
31000	186	16.838	7.896
33000	227	16.672	8.270
35000	148	17.096	7.838
37000	104	17.015	8.819
39000	45	15.878	7.962
41000	25	15.787	8.160
43000	1	27.591	0.000
45000	0	0.000	0.000
Total	1363		

Table 10: Statistics on Aircraft Encounters by Altitude for Hour 1

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	0.347	0.000
4000	2	22.946	2.473
5000	3	18.671	9.230
6000	1	15.766	0.000
7000	0	0.000	0.000
8000	1	22.201	0.000
9000	3	22.401	9.696
10000	0	0.000	0.000
11000	0	0.000	0.000
12000	1	14.031	0.000
13000	0	0.000	0.000
14000	1	23.205	0.000
15000	1	24.726	0.000
16000	1	8.889	0.000
17000	1	29.727	0.000
18000	5	19.643	5.816
19000	5	22.016	4.417
20000	2	20.213	10.804
21000	0	0.000	0.000
22000	1	16.103	0.000
23000	4	16.462	7.675
24000	1	21.415	0.000
25000	1	10.060	0.000
26000	1	7.196	0.000
27000	7	16.189	9.883
28000	13	17.303	6.713
29000	16	18.837	6.960
31000	45	17.064	7.770
33000	32	17.181	8.811
35000	8	15.920	9.868
37000	9	15.787	10.373
39000	4	12.280	7.693
41000	0	0.000	0.000
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	170		

Table 11: Statistics on Aircraft Encounters by Altitude for Hour 2

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	1	27.299	0.000
5000	4	9.730	7.513
6000	5	21.375	8.707
7000	5	20.935	3.251
8000	8	15.758	8.395
9000	4	19.783	7.432
10000	4	19.494	9.688
11000	4	25.128	3.659
12000	5	20.837	4.669
13000	2	19.909	3.224
14000	1	26.824	0.000
15000	5	16.520	7.027
16000	10	14.009	7.545
17000	6	17.553	6.561
18000	8	18.176	7.181
19000	6	21.735	5.245
20000	7	14.752	7.667
21000	0	0.000	0.000
22000	2	15.666	8.706
23000	1	19.823	0.000
24000	2	20.574	6.057
25000	3	18.447	10.027
26000	4	20.785	6.982
27000	5	17.011	7.916
28000	5	21.889	6.499
29000	11	18.135	7.955
31000	46	17.085	7.151
33000	50	15.379	8.548
35000	34	18.058	7.446
37000	18	22.917	6.653
39000	9	17.731	7.504
41000	3	15.969	6.745
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	278		

Table 12: Statistics on Aircraft Encounters by Altitude for Hour 3

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	2	27.325	1.478
5000	3	7.692	7.691
6000	5	19.590	5.532
7000	7	19.306	6.627
8000	1	23.193	0.000
9000	3	13.711	12.653
10000	5	12.797	10.838
11000	2	22.933	9.349
12000	7	13.770	10.552
13000	5	20.411	4.962
14000	10	18.368	5.126
15000	2	13.920	15.156
16000	2	26.390	1.144
17000	3	17.684	7.663
18000	6	17.573	5.140
19000	4	15.111	9.451
20000	5	16.777	9.277
21000	3	19.503	6.172
22000	1	11.298	0.000
23000	10	14.697	7.550
24000	4	23.419	7.459
25000	5	17.225	10.858
26000	5	21.455	7.023
27000	23	17.086	7.832
28000	25	21.734	7.590
29000	29	16.747	8.323
31000	49	16.011	8.551
33000	55	17.832	8.663
35000	47	16.694	7.755
37000	32	14.945	8.753
39000	25	15.812	8.302
41000	15	17.766	7.445
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	400		

Table 13: Statistics on Aircraft Encounters by Altitude for Hour 4

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	26.011	0.000
4000	0	0.000	0.000
5000	6	20.024	6.584
6000	8	15.241	5.329
7000	6	19.759	8.516
8000	1	12.358	0.000
9000	6	15.483	10.823
10000	6	17.311	6.932
11000	2	26.051	0.266
12000	5	16.526	8.957
13000	3	14.861	10.648
14000	2	10.186	12.128
15000	3	16.349	10.914
16000	16	17.045	8.046
17000	7	18.203	7.989
18000	11	18.130	7.958
19000	10	20.120	5.281
20000	12	16.384	6.201
21000	7	19.587	4.858
22000	2	20.500	7.912
23000	2	19.043	8.274
24000	7	19.262	5.939
25000	5	19.674	8.360
26000	9	15.353	7.682
27000	18	16.878	10.201
28000	18	14.817	7.885
29000	27	16.271	5.522
31000	38	17.109	8.692
33000	68	16.110	7.894
35000	50	17.907	7.771
37000	39	17.089	8.201
39000	7	15.791	8.407
41000	4	10.684	11.130
43000	1	27.591	0.000
45000	0	0.000	0.000
Total	407		

Table 14: Statistics on Aircraft Encounters by Altitude for Hour 5

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	1	17.970	0.000
5000	1	19.368	0.000
6000	0	0.000	0.000
7000	1	8.233	0.000
8000	0	0.000	0.000
9000	0	0.000	0.000
10000	1	25.658	0.000
11000	1	25.406	0.000
12000	0	0.000	0.000
13000	1	23.696	0.000
14000	0	0.000	0.000
15000	3	18.325	10.418
16000	5	19.797	4.630
17000	5	15.093	3.501
18000	3	17.429	5.664
19000	3	18.578	8.915
20000	0	0.000	0.000
21000	3	20.100	11.633
22000	1	19.620	0.000
23000	2	17.073	8.575
24000	0	0.000	0.000
25000	3	12.220	4.497
26000	6	16.000	9.340
27000	4	16.915	10.058
28000	12	20.642	5.209
29000	4	14.676	8.322
31000	8	17.914	5.624
33000	22	17.704	7.000
35000	9	12.097	7.803
37000	6	11.711	10.201
39000	0	0.000	0.000
41000	3	12.514	9.055
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	108		